

REMARKS/ARGUMENTS

Applicants' attorney thanks Examiner Nguyen for his Office Action dated October 18, 2006. Claims 10, 15, 36, and 39 have been amended to address certain issues. Claims 1-9, 19-21, and 23-24 were previously cancelled. Claims 16-18 are cancelled herein. Claim 40 has been withdrawn. Claims 43-44 are added. Therefore, Claims 10-15, 22, and 25-39 and 41-44 are now pending in this application.

Rejections Under 35 U.S.C. § 112:

Claims 36-39 and 41-42 have been rejected under 35 U.S.C. § 112, 2nd paragraph as being indefinite.

As to Claim 36, the Action holds that the “inlaid conducting structure” is indefinite with respect to the following claim elements. The Applicants disagree in that they believe that the inlaid conducting structure is clearly implicit in all the followings steps, “forming a first copper seed layer” that goes on the insulating layer and in the opening, “forming an inter-layer barrier layer the first copper seed layer”, “forming a second copper seed layer on the inter-layer barrier layer”, “forming a bulk copper-containing layer on the second copper seed layer”; then “annealing the substrate”; “forming a bulk copper layer that fills the opening”; and planarizing the bulk copper layer”. Basically, all the layers are formed one over another to fill the hole and a planarization step completes the process of forming the “the inlaid conducting structure”. This is implicit in the described and claimed process.

However, in an effort to clarify this matter, the Applicants have amended Claim 36 to recite “planarizing the bulk copper layer to complete construction of the inlaid conducting structure”. It is believed that this change clarifies the language and does not change the scope of the invention. Therefore, the Applicants respectfully submit that the foregoing amendment addresses this ground of rejection. Therefore, the Applicants respectfully request that this ground of rejection be withdrawn.

As to Claim 39, this claim has been superficially amended to add further clarifying language that should be sufficient to remedy any existing causes of indefiniteness.

As to remaining rejected Claims 38 and 41-42 (which depend on amended Claim 36), the foregoing amendment also applies and is believed to remove any indefiniteness in the claim language. Therefore, the Applicants respectfully submit that the foregoing amendment addresses this ground of rejection and, therefore, Applicants respectfully request that this ground of rejection also be withdrawn.

Therefore, the Applicants respectfully submit that the foregoing amendments address all §112 grounds of rejection and, therefore, Applicants respectfully request that this ground of rejection be withdrawn as to all Claims 36-39 and 41-42.

Rejections Under 35 U.S.C. §103:

Claims 10-18 are rejected under 35 U. S. C. § 103(a) as being obvious over *Hsiung et al.* (U.S. Pat. Publ. No. 2002/0045345 hereinafter “*Hsiung*”) in view of *Andricacos et al.* (USPN 6,268,291 hereinafter “*Andricacos*”).

Claims 16-18 are cancelled rendering further discussion of these claims irrelevant.

However, the Applicants point out that the cited pair of references is (in view of the amendments made) no longer sufficient to reject base Claim 10 (or any of the dependent Claims 11-15). As amended, Claim 10 recites “a first barrier layer and a second barrier layer ... wherein the second barrier layer consists of a material selected from the group: palladium, magnesium, and molybdenum” (emphasis added). No such barrier layers are described or suggested in the cited art.

Additionally, the process includes the formation of “a copper seed layer “ and implanting the seed layer with barrier material ions to form an implanted seed layer”. This is followed by forming a bulk copper containing layer on the implanted seed layer” and “annealing the substrate, so that the barrier material ions migrate through the seed layer to the interface between the at least one barrier layer and the copper seed layer to form a final barrier layer.” The cited art does not teach migration of implantation materials.

Additionally, the Applicants point out that the cited art does not capture the further limitations impressed upon the dependent claims (Claims 11-15). However, in view of the arguments already made in support of Claim 10, further discussion of the particular points of novelty of each dependent claims is deemed unnecessary at this time.

Moreover, added Claim 43 addressed novel implantation materials and is also deemed patentable for this added reason.

Thus, for these many reasons, the Applicants respectfully submit that the cited art is overcome by the amendments and arguments made herein and that these claims (Claims 10-15 and also added Claim 43) should also be allowed.

Double Patenting Rejections:

Claims 10-18, 22, 25-39, and 41-42 have been rejected under the judicially created doctrine of obviousness-type double patenting.

Terminal Disclaimer:

The Applicants hereby disclaim, except as provided below, the terminal part of the patent being examined, which would extend beyond the expiration date of Patent No. 6,727,177, as presently shortened by any terminal disclaimer. Applicants hereby agree that the patent which is granted as a result of this proceeding shall be enforceable only for and during such period that it and the above-listed patent are commonly owned. This agreement is binding upon the patent owner, its successors, or assigns at some future time should it become necessary in the future.

Thus, for at least this reason, the Applicants respectfully submit that the cited art is overcome by the amendments and arguments made herein and that these claims (Claims 10-18, 22, 25-39, and 41-42) should be allowed to issue.

Added Claims:

Claims 43 and 44 have been added to capture certain patentable subject matter.

In particular, Claim 43 is directed to a range of implantable materials that can be implanted into the seed layer of Claim 10 recited as “barrier material ions to form an implanted seed layer includes implanting material selected from the group: palladium, chromium, tantalum, magnesium, and molybdenum, vanadium and tungsten”.

Claim 44 is directed to a slightly different process and a different range of materials, for example, such as the “implanted barrier material ions being selected from the group: palladium, chromium, tantalum, magnesium, and molybdenum, vanadium and tungsten” recited in Claim 44.

The Applicants respectfully submit that these claims are allowable as submitted.

Conclusion:

In view of the foregoing amendments and remarks, it is respectfully submitted that the claimed invention as presently presented is patentable over the art of record and that this case is now in condition for allowance.

Accordingly, the Applicants request withdrawal of all pending rejections and request reconsideration of the pending application and prompt passage to issuance. As an aside, the Applicants clarify that any lack of response to any of the issues raised by the Examiner is not an admission by the Applicants as to the accuracy of the Examiner’s assertions with respect to such issues. Accordingly, Applicants specifically reserve the right to respond to such issues at a later time during the prosecution of the present application, should such a need arise.

As always, the Examiner is cordially invited to telephone the Applicants’ representative to discuss any matters pertaining to this case. Should the Examiner wish to contact the undersigned for any reason, the telephone number set out below can be used.

If any fees are due in connection with the filing of this Amendment, the Commissioner is hereby authorized to charge such fees to Deposit Account 12-2252 (Order No. 01-471/1D).

Respectfully submitted,

BEYER WEAVER LLP



Francis T. Kalinski II
Registration No. 44,177

P.O. Box 70250
Oakland, CA 94612-0250
Telephone: (650) 961-8300